

In manual training schools, technical schools, colleges, and post graduate or university research schools, wherever the primary object is to teach and practise the greatest exactness of construction, observation, and investigation; there, of course, nothing but the best should be allowed. These schools are conducted by teachers who understand exactness; it is mostly the public grade schools or high schools that apply for advice as to apparatus for elementary educational purposes.

For high schools and lower grades, the object of whose instruction is to teach general principles and the elements of physics, expensive accurate measuring apparatus is not required. The scholar will learn general laws and principles better by making a rough instrument himself than by merely looking at a highly finished one.

When a teacher desires to maintain a daily weather record as a voluntary observer, he must be provided with the standard apparatus of the Weather Bureau. No cheaper makeshift will do. He need not buy a complete outfit, but what he has must be standard. But when such a record is kept only for local educational purposes as the beginning of a system of training for young pupils, expensive apparatus is objectionable, and the simplest (not always the cheapest) apparatus is most desirable, so that a youth may handle it and easily see how it works and what its source of error may be. For such cases the mercurial thermometer divided on its glass stem, the sling psychrometer, the wind-pressure anemometer, using a pendulous sphere or a square plate, or a Lind anemometer, a home-made syphon mercurial barometer, a Campbell sunshine recorder with a burning glass as a substitute for the expensive sphere, these among others offer the desired simplicity, while sufficient to record the atmospheric phenomena abundantly for educational purposes.

It seems very inadvisable to introduce into elementary schools expensive instruments that are used for exact scientific work or exemplify the best methods of science, such as a Green-Fortin barometer, or the Robinson whirling anemometer, whose structures are complex and whose actions and corrections depend on a theory that can not be demonstrated by simple reasoning adapted to the elementary knowledge of the pupil. Let a youth learn about the more complex and precise physical apparatus after he passes on to the college and higher technical schools. He will then come to understand the sources of error of the so-called "popular" instruments, and understand the lingo of the salesman of "school supplies" who recommends the wooden support of his barometer scale as making an absolutely constant and correct instrument, or his thermometer as equal to those of the Weather Bureau. The best part of education is to teach a man where to go for reliable information on matters that he has not himself thoroughly studied, and how to protect himself against imposition of all kinds.—C. A.

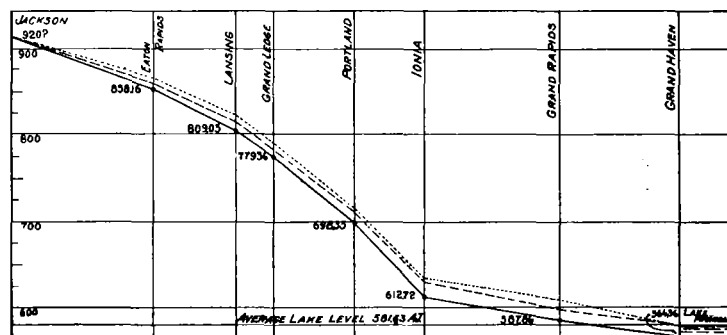
A RIVER AND FLOOD SERVICE ON THE GRAND RIVER OF MICHIGAN.

In view of the recent extension of the River and Flood Service of the Weather Bureau in various parts of the country, we may perhaps call attention to certain minor advantages incidental to this work, whose main purpose is the protection of lives and property threatened by high water. The careful study of the rivers by this service, and the systematic observations carried out at river stations yield information of high value in connection with questions of water power, water supply, irrigation, and other hydrographic problems, and on the larger streams are of the utmost importance in connection with navigation and the work of river improvement. Something on these points is suggested by the following statements:¹

¹ From the December report of the Michigan Section of the Climate and Crop Service of the Weather Bureau, by C. F. Schneider, Section Director at Grand Rapids, Mich.

In view of the destructive floods along the Grand River of Michigan in March, 1904, the Chief of the Weather Bureau has inaugurated a river and flood service on that river; with the Grand Rapids Weather Bureau Office as the river center. River gages have been located at Eaton Rapids, Lansing, Grand Ledge, Portland, Ionia, and Grand Rapids, and readings will be made daily during February, March, and April, and at any other season when necessary. These stations are also equipped with rain gages, and in connection with a special rainfall station at Jackson will furnish the data regarding the height of the river and amount of precipitation.

The Weather Bureau made a careful survey of the river in order to determine the height of the river bed at the various gage stations. In all cases the zero of the gage is the same as the bed of the river, and the danger line was determined by consultation with the principal manufacturing interests. From marks preserved by various citizens the elevation of the high water of March, 1904, was also determined. Much of this data is entirely new and very interesting. The rapid fall of the river between Grand Ledge and Ionia is a feature that has never before been definitely determined, and the great possibilities of that particular section for water power are clearly shown. The drainage area of the Grand River, 5572 square miles, is the second largest in the State.



Profile Showing Fall of River Between Gage Stations
High Water Danger Line ————
High Water MARCH 26-27 1904 - - - -

FIG. 1.

The floods of the last decade of March, to which Mr. Schneider refers, were caused by rains that melted the accumulated snow of almost the entire winter while the ground was frozen and unable to absorb any of the water thus suddenly formed. At Grand Rapids about 14,000 persons were rendered temporarily homeless, and the total damage by the flood in that city alone is estimated at \$2,000,000.—F. O. S.

WEATHER BUREAU MEN AS INSTRUCTORS.

Mr. William G. Burns, Section Director, Springfield, Ill., on January 25 addressed the class in physical geography from the Springfield High School, at the office of the Weather Bureau. Mr. Burns described the work of the Weather Bureau and explained the principles of forecasting, the construction of the weather map, and the use of meteorological instruments.

Mr. David Cuthbertson, Local Forecaster, Buffalo, N. Y., states that students from two of the local high schools, and also from the Lancaster, N. Y., High School, visited the office during January and received instruction in elementary meteorology, with an explanation of the instruments and work of the Weather Bureau.

Mr. G. A. Loveland, Section Director, Lincoln, Nebr., delivered two addresses before the Farmers' Institute; on January 5, at Johnson, Nebr., on "Weather Forecasts, how Made, Distributed, and Used," and on January 31, at Fairbury, Nebr., on "The Climate of Nebraska."

Mr. George T. Todd, Observer, Wichita, Kans., on January 19 addressed the preparatory class of Fairmount College. The